



Evaluation #

New Product # 20069010
Previous # 200610-I

Safety & Buildings Division
201 West Washington Avenue
P.O. Box 2658
Madison, WI 53701-2658

Wisconsin Building Products Evaluation

Material

Insulating Concrete Form

Manufacturer

BuildBlock Building Systems, LLC
9701 N. Broadway Ext.
Oklahoma City, OK 73114

SCOPE OF EVALUATION

GENERAL: This report evaluates the use of the insulated concrete form wall system, manufactured by BuildBlock Building Systems, LLC, evaluated as permanent form work and insulation system for reinforced lintels, exterior walls, and foundation walls. The BuildBlock Building Systems insulated concrete form wall system was evaluated for safety requirements of the foam plastic and structural requirements for the codes listed below.

The **Comm** requirements below in accordance with the current **Wisconsin Uniform Dwelling Code for 1- and 2-family dwellings:**

- **Foam Plastic:** The BuildBlock Building Systems insulated concrete form wall system was evaluated in accordance with the fire safety requirements of **s. Comm 21.11**.
- **Structural:** The BuildBlock Building Systems insulated concrete form wall system was evaluated in accordance with the structural requirements of **ss. Comm 21.02**, and **21.02(3)(c)**.

The **IBC** requirements below in accordance with the current **Wisconsin Amended ICC Code:**

- **Foam Plastic:** The BuildBlock Building Systems insulated concrete form wall system was evaluated in accordance with the fire safety requirements **ss. IBC 2603.1, 2603.2, and 2603.3**.
- **Structural:** The BuildBlock Building Systems insulated concrete form wall system was evaluated in accordance with the requirements of **IBC Chapter 16**.
- **Fire Endurance:** The BuildBlock Building Systems insulated concrete form wall system was evaluated in accordance with the requirements of **ss. IBC 2603.4, 2603.5.1, and 2603.5.2**.

Note: Structural calculations shall be submitted (job-to-job basis) in accordance with **IBC Chapter 16** for **Live, Ground Snow, Roof, Wind, and Seismic Loads**.

DESCRIPTION AND USE

General: The BuildBlock Building Systems insulated concrete form is manufactured using 100% modified expanded polystyrene from one of the following manufacturers: Nova Chemicals, Inc., BASF Corporation, or Huntsman Chemical.

BuildBlock Building Systems insulated concrete forms (ICF's) are stay-in-place forming for cast-in-place concrete walls. The ICF forming system has no final structural value for the wall. It is the concrete wall that is cast between the inner faces of the panels of extruded or expanded polystyrene foam that is the structural component.

BuildBlock Building Systems insulated concrete forms (ICF's) are manufactured using Expandable Polystyrene beads (EPS). BuildBlock ICF's manufactured in Colorado Springs, Colorado and Pardeeville, Wisconsin currently use the **40 series** from Huntsman, the **BFL type** from BASF and the **M97 bead** from Nova. BuildBlock ICF's manufactured at the Jerome and Post Falls, Idaho locations currently use the **MC-500 type** from Styrochem and the **Starex SF series** from Korea.

BuildBlock ICF's are manufactured with a **density of 1.50 pcf**, and a **thickness of 2.5 inches**.

BuildBlock Building Systems, LLC insulated concrete forms are manufactured in the following sizes:

Height (all): 16 inches		Width	Length	Return	Surface Area	Concrete Volume
6"	BB-600: Straight Form	11" (6" core)	48"	n/a	5.33	.09876 cu. yd.
	BB-690: 90° Corner	11" (6" core)	33"	21"	6.0	.086534 cu. yd.
	BB-645: 45° Corner	11" (6" core)	28"	16"	4.89	.05615 cu. yd.
8"	BB-800: 90° Straight	13" (8" core)	48"	n/a	5.33	.131682 cu. yd.
	BB-890: 90° Corner	13" (8" core)	35"	23"	6.44	.121514 cu. yd.
	BB-845: 45° Corner	13" (8" core)	28"	16"	4.89	.072503 cu. yd.
	BB-800: Brick Ledge	13" (8" core)	48"	n/a	5.33	Entire block: 0.167074 Corbels only: 0.035556

TESTS AND RESULTS

- Surface Burning Characteristics of BuildBlock Insulated Concrete Form Building System, EPS, in accordance with **ASTM E84**, "Standard Test Method for Surface Burning Characteristics of Building Materials".

ASTM E84 Test Results:

Foam Plastic Mfg.	Density Maximum Thickness				
		1.0 pcf 1"	1.0 pcf 2"	1.0 pcf 4"	1.0 pcf 5"
Huntsman Type Grade 54	Flame Spread	0	20	35	35
	Smoke Development	180	Over 500	Over 500	Over 500
Huntsman Type Grade 54	Flame Spread	1.5 pcf 1"	1.5 pcf 2"	1.5 pcf 4"	1.5 pcf 5"
	Flame Spread	5	40	40	125
	Smoke Development	350 - 450	Over 500	Over 500	Over 500
Huntsman Type Grade 54	Flame Spread	1.75 pcf 1"	1.75 pcf 1"	1.75 pcf 1"	1.75 pcf 1"
	Flame Spread	15	30	80	100
	Smoke Development	Over 500	Over 500	Over 500	Over 500

ASTM E84 Test Results continued:					
Huntsman Type Grade 54		2.0 pcf 5"	-----	-----	-----
	Flame Spread	135	-----	-----	-----
	Smoke Development	Over 500	-----	-----	-----
BASF Types: BF-020, -122, -134, -222, -229, -322, -326, -327, -329, -421, -422; Types: BFL-020, -122, -134, -222, -229, -322, -326, -327, -421, -422; and Types: F212, -F213, and F412 (Styropor)		1.5 pcf 6"	1.5 pcf 6"	1.5 pcf 5"	1.5 pcf 5"
	Flame Spread	15	5	10	5
	Smoke Development	125	190	300	250
NOVA Types: M-77 (A, A-HD, A-LV, A-NL, B, B-HD, B-HDS, B-LK, B-LV, B-NL, C, C-HD, C-NL) Type: M-97		2.0 pcf 1" - 2"	2.0 pcf 4"	2.0 pcf 5"	2.0 pcf 6"
	Flame Spread	10	10	10	10
	Smoke Development	200	200	200	200
NOVA Types: M-77 (B, B-HD, B-LV, BC) Type: M-97 (BC)		1.0 pcf 2" max.	1.0 pcf 4" max.	1.0 pcf 5" max.	1.0 pcf 6" max.
	Flame Spread	40	80	80	80
	Smoke Development	450	Over 450	Over 450	Over 450
NOVA Types: M-77 (B, B-HD, B-LV, BC) Type: M-97 (BC)		1.5 pcf 1" max.	1.5 pcf 3" max.	1.5 pcf 4"	1.5 pcf 6"
	Flame Spread	25	75	90	95
	Smoke Development	450	Over 450	Over 450	Over 450
NOVA Types: M-77 (B, B-HD, B-LV, BC) Type: M-97 (BC)		2.0 pcf 1" max.	3.0 pcf 3" max.	2.0 pcf 4"	2.0 pcf 6"
	Flame Spread	45 - 80	45 - 80	45 - 130	45 - 130
	Smoke Development	Over 500	Over 500	Over 500	Over 500
NOVA Types: 33M (A, A-HD, A-HL, B, B-HD, B-HDS, B-NL, C), MOD-OGFS, -OGMF, -OGMO or 33M(A, B, B-K, B-LL or C)		1.0 pcf 1"	1.0 pcf 1 5/8"	2.0pcf 4"	2.0pcf 5"
	Flame Spread	5	5	5	15
	Smoke Development	250 - 300	350 - 450	Over 500	350 - 450
NOVA Types: 33M (A, A-HD, A-HL, B, B-HD, B-HDS, B-NL, C), MOD-OGFS, -OGMF, -OGMO or 33M(A, B, B-K, B-LL or C)		-----	-----	1.25 pcf 4 "	1.25 pcf 5" max.
	Flame Spread	-----	-----	20	40
	Smoke Development	-----	-----	300 - 500	300 - 500
NOVA Types: 33M (A, A-HD, A-HL, B, B-HD, B-HDS, B-NL, C), MOD-OGFS, -OGMF, -OGMO or 33M(A, B, B-K, B-LL or C)		2.0 pcf 1"	-----	2.0 pcf 4"	2.0 pcf 5"
	Flame Spread	20	-----	85	125
	Smoke Development	Over 500	-----	Over 500	Over 500

- Intertek Testing Services NA Ltd./Warnock Hersey conducted a spontaneous ignition test on the polypropylene web ties in accordance with **ASTM D 1929**, "Standard Test Method for Determining

Ignition Temperature of Plastics”, Section 8.2 of the standard only, “Spontaneous Ignition Temperature”. Report No. 3075407(a)

- Intertek Testing Services NA Ltd./Warnock Hersey conducted a flammability test on the polypropylene web ties in accordance with **ASTM D635**, “Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position”. Results: Linear Burn Rate of 22.3 mm/min., and Maximum Burn Rate for Specimen 40 mm > 3 mm < 13 mm. Report No. 3075407(b)
- Intertek Testing Services NA Ltd./Warnock Hersey conducted a room fire test in accordance with UBC Standard 26-3. Report No. 3075407(c)
- ICC Evaluation Services’ AC 12, Acceptance Criteria for Foam Plastic Insulation, dated February 2005. To comply with AC 12, the thermal insulation component of the product was tested in accordance with **ASTM C 578**, “Specification for Rigid, Cellular Polystyrene Thermal Insulation”. In addition, the reinforcing tie component was tested to determine ultimate tensile load, fastener withdrawal capacity, and fastener lateral resistance. See Report Number 3074552-01 for: compressive strength test data; thermal resistance test data; flexural strength test data; water vapor permeance test data; limited oxygen index test data; density test data; dimensional stability test data; water absorption test data; ultimate load test data; fastener withdrawal test data; and fastener lateral resistance test data.
- **ASTM E119** Fire Test of Building Construction and Materials, a 3-hour fire resistance test of a load-bearing insulated concrete form wall. See test construction below. Report No. 3174-3083037, Rev. 1.

The subject test specimen is a traceable sample selected from the manufacturer’s facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures under its Listing and Follow-up Service program.

The wall assembly was constructed from BB600 expanded polystyrene foam blocks (48" long x 16" tall x 11" thick, nominal 1.5 pcf density). The core was 6" thick. Each side of the block was connected to the other side with polypropylene ties spaced 6" o.c. The forms were constructed in a running bond pattern, with all joining surfaces receiving a bead of polyurethane adhesive foam (Foam2Foam™) as the wall was constructed. #5 steel rebar was placed horizontally at the top of the 1st, 3rd, 5th, 7th, and top rows of block (32" o.c. horizontally). Vertical #5 steel rebar was placed 24" o.c. starting 6" from one end. The wall was filled with minimum 3,000 psi (6" slump) concrete delivered through a hose connected to a pumper truck. The concrete was allowed to sit for 30 days, at which time the foam was removed from the side to be exposed to the fire. The wall was then placed on top of a horizontal furnace with the bare concrete side down, and the temperature inside raised to 250°F for approximately three weeks. A hole was drilled mid-depth in the wall to measure the relative humidity of the air inside. The relative humidity eventually reached 75% at that location AT 70°F, indicating the wall was at moisture equilibrium. Thermocouples were placed on the unexposed surface in accordance with the standard, and the test was conducted for a period of 3 hours.

Results: After the fire and hose stream tests, the load was increased incrementally from 5,000 lbs/lineal foot to 7,500 to 10,000 to 12,000. The wall was measured for deflection at the mid-height at the left and right sides of the wall. There was no noticeable deflection at any of the increased loads.

- Thermal Resistance testing in accordance with **ASTM C 518** was conducted by the Commercial Testing Company, Report No. 05-06130, June 9, 2005.

Mean Temperature (°F)	ΔX (inch)	Thermal Conductivity, <i>k</i> (Btu • in • h ⁻¹ • ft ⁻² • °F ⁻¹)	Thermal Resistance, <i>R</i> (h • ft ² • °F • Btu ⁻¹)	Thermal Resistance, <i>R</i> per inch (h • ft ² • °F • Btu ⁻¹)
75.0	0.995	0.2453	4.06	4.08

- **ASTM E96**, “Test Methods for Water Vapor Transmission of Materials.

Mean Result	6.44E-01 g/hour-m ²	117 ng/Pa-s-m ² -in
	1.55E+01 g/day-m ²	2.04 perms/in
Coefficient of Variation	5.48 %	5.48 %

Report No. 3074552.

The above test data is on file with the department.

LIMITATIONS OF APPROVAL

The **Comm** limitations below are in accordance with the current **Wisconsin Uniform Dwelling Code, for 1 & 2 family dwellings**:

- **Foam Plastic:** The BuildBlock Building Systems insulated concrete form wall system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. Comm 21.11(1)**. Where a 1-inch thickness of masonry does not separate the polystyrene blocks from the building interior, including at the top of the wall, a thermal barrier, that has a finish rating of at least 15 minutes, shall be provided.
 1. BuildBlock form blocks are approved for use in combustible non-rated construction in accordance with **s. Comm 21.11**. In one- or two-family dwellings, thermal barriers shall be provided to separate the forms from the occupied space of the dwellings per **s. Comm 21.11**.
 2. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.
- **Structural:** The BuildBlock form blocks are approved as structural building elements.
 1. The units are approved for use as concrete forms for basement walls and exterior walls when the resulting concrete core thickness satisfies **Table 21.18-A** for one- or two-family dwellings, or when structural calculations for the product are submitted for review.
 2. Walls shall be anchored to all floors and roofs. Walls shall be interconnected at corners by embedding and lapping the reinforcement.
 3. Structures are **limited** to two stories in height.
 4. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
 5. Below grade walls shall be damp-proofed when required by the local building department.
 6. Damp-proofing and water-proofing materials shall be approved by BuildBlock and the local building official, and shall be free of solvents that will adversely affect the EPS foam.

NOTE: The BuildBlock ICF wall system was **not** evaluated for compliance with the thermal requirements of **Subchapter VI, ss. Comm 22.20, 22.21, 22.23, 22.25, 22.27, 22.28, and 22.31** of the current **Wisconsin Uniform Dwelling Code, for 1 & 2 family dwellings**.

The **IBC** limitations below are in accordance with the current **Wisconsin Amended ICC Code**:

- **Foam Plastic:** The BuildBlock ICF wall system is approved for use with a thermal barrier to separate the blocks from interior spaces in accordance with **s. IBC 2603.4**.
 1. In accordance with **s. IBC 2603.4.1.6**, when BuildBlock ICF is used within the attic or crawl space where entry is made only for service utilities, the foam plastic insulation shall be protected against ignition by 1-1/2" thick mineral fiber insulation, a 1/4" thick wood structural panel, particleboard or hardboard, gypsum wallboard, corrosion-resistant steel or other approved material installed so that the foam plastic is not exposed.
 2. The protective covering shall be consistent with the requirements for the type of construction.
 3. The exterior face of the blocks shall be finished with an approved weather covering and must be protected from ultraviolet light.
 4. The crawl space shall not be used for storage or air handling purposes, there are no interconnected basement areas and entry to the crawl space is only for service of utilities.
- **Structural:** Design of concrete formed by BuildBlock ICF forms must comply with **IBC Chapter 19** with the following requirements:
 1. The forms are approved for use as concrete forms for basement walls, exterior walls and retaining walls when structural calculations are submitted to the department by a Wisconsin registered professional engineer or architect.
 2. Design calculations of walls must comply with **s. IBC 1901.2**. Use of the empirical design approach specified in **s. 2109.1 [Comm 62.2109(1)]** is prohibited.
 3. Design of lintels shall comply with the applicable provisions of **IBC Chapter 16**.

4. Wall loading shall be in accordance with **IBC Chapter 16**.
5. Minimum wall reinforcement shall conform to **s. IBC 1901.2**. When the code requires that vertical and horizontal reinforcement be spaced no further apart than 18 inches or three times the wall thickness, whichever is less, the maximum concrete wall thickness along the length of the wall is permitted to be used to determine rebar spacing.
6. Walls shall be anchored to floors and roofs in accordance with **s. IBC 1604.8.2**. Walls shall be interconnected at corners by embedding and lapping reinforcement in accordance with the code.
7. Design of shear walls shall be in accordance with **ss. IBC 1901.2 and 1910**.
8. Structures are **limited** to two stories in height plus a basement.
9. Below grade walls shall be damp-proofed when required by the local building department, water-proofed in accordance with **s. IBC 1806**.
10. Damp-proofing and water-proofing materials shall be approved by BuildBlock and the local building official, and shall be free of solvents that will adversely affect the EPS foam.
11. Special inspection is required as noted in **s. IBC 1704**, for placement of reinforcing steel and concrete, and for concrete cylinder testing, except that special inspection is not required for foundation stem walls conforming to **Table 1805.4.2** of the **IBC**. Additionally, when the building official approves, special inspection is not required when all of the following conditions are met:
 - a) Wall systems are a maximum of 8 feet high and are limited to use in single-story construction of Group R-3, or Group U Occupancies.
 - b) Maximum height of a concrete pour is 48 inches. Succeeding lifts must be placed in accordance with **s. IBC 1905.10**.
 - c) Installation is by properly trained installers approved by BuildBlock.
 - d) All steel reinforcement shall be in accordance with **s. IBC 1903.5**.
 - e) The installation instructions indicate methods used to verify proper placement of concrete.
12. Walls constructed with BuildBlock insulated concrete form blocks are considered Type V Construction.

Alternate Design: In lieu of calculations, the structural design of reinforced concrete formed by BuildBlock Insulated Concrete Form wall system for residential construction is permitted to comply with the *Prescriptive Method for Insulating Concrete Forms in Residential Construction* (publication No. EB118), dated May 1998, published by the Portland Cement Association (PCA). Buildings constructed with the BuildBlock Insulated Concrete Form wall system and designed in accordance with the alternate design, will not exceed a height of two stories plus a basement, where the maximum unsupported wall height is 10 feet.

NOTE: The BuildBlock Insulated Concrete Form wall system was **not** evaluated for compliance with the thermal requirements of **s. Comm 63.1018**.

Identification: Each package bears a label specifying the name and address of the manufacturer BuildBlock ICF. Additionally, product labels indicate the Wisconsin Building Product Evaluation Number (200610-I), and the name and logo of the quality control agency.

This approval will be valid through December 31, 2011, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The product approval is applicable to projects approved under the current edition of the applicable codes. This approval may be void for project approvals made under future applicable editions. The Wisconsin Building Product Evaluation number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement not specified in this document.

Revision Date:

Approval Date: September 6, 2006 By: _____

Lee E. Finley, Jr.
Product & Material Review
Integrated Services Bureau

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